

A <u>T</u>heraSphere <u>A</u>dvanced dosimetry <u>R</u>etrospective <u>G</u>lobal study <u>E</u>valuation in hepatocellular carcinoma <u>T</u>reatment (TARGET): analyses from the phantom study

Presenting Author Grace Keane^[1] g.e.m.keane@umcutrecht.nl

CO AUTHORS: MARNIX LAM,^[1] ROB VAN ROOIJ,^[1] HUGO DE JONG ^[1] Affiliations: ^[1] University Medical Centre, Utrecht

Introduction

An international, retrospective multi-center study investigating multi-compartment dosimetry in yttrium-90 (90Y) radioembolization.

Objectives of the study

- Evaluate inter-site variability of 99mTc imaging
- Evaluate impact of site specific protocol vs a harmonized protocol

Methods

- 14 sites, 7 countries and 22 SPECT systems were included in the analysis
- A NEMA IQ phantom was imaged and contrast recover coefficients (CRC) computed as part of a tumour dosimet investigation. SPECT imaging was performed for:
 - i) a site-specific protocol(s), ii) a standardized protocol and a standardized protocol with an imaging system-speci post reconstruction filter aimed at harmonizing CRCs
- A NEMA IQ phantom and cylindrical phantom were image and Lung Shunt Fraction computed. Imaging was performed for:
 - i) a site-specific protocol, ii) a standardized protocol and iii) protocol where energy window-based scatter correcti was applied retrospectively.



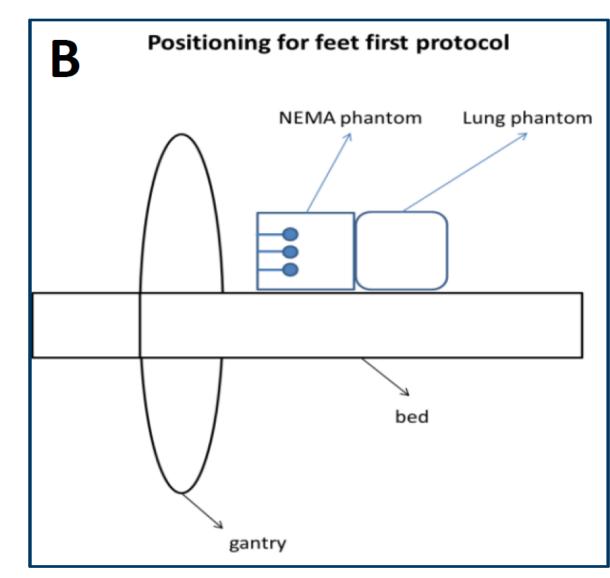


Figure 1. Example of phantom position for feet first set-up protocol, from a real set-up (left) and schematic (right)

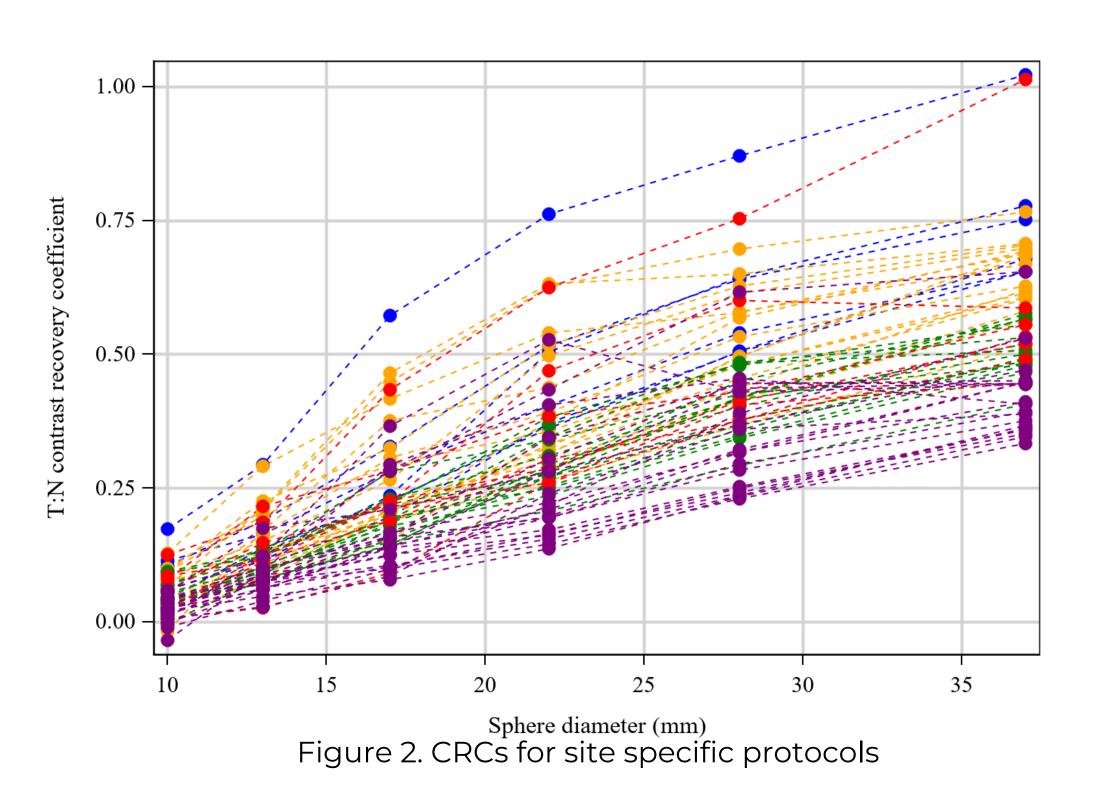
Site / Country	No. of cameras	No. of site protocols
Rennes / France	1	1
Mount Sinai / USA	7	7
UFL/ USA	2	2
UMCU / Netherlands	1]
UW/USA	4	6
CHUV / Switzerland	2	4
EUH / Germany	1]
FNH/Turkey	2	2
IU / Turkey	٦	7
Indiana / USA	٦]
MD Anderson / USA	1	7
Milan / Italy	2	4
Northwestern / USA	2	2
Stanford / USA	1	4
<u>Total</u>	<u>22</u>	<u>31</u>

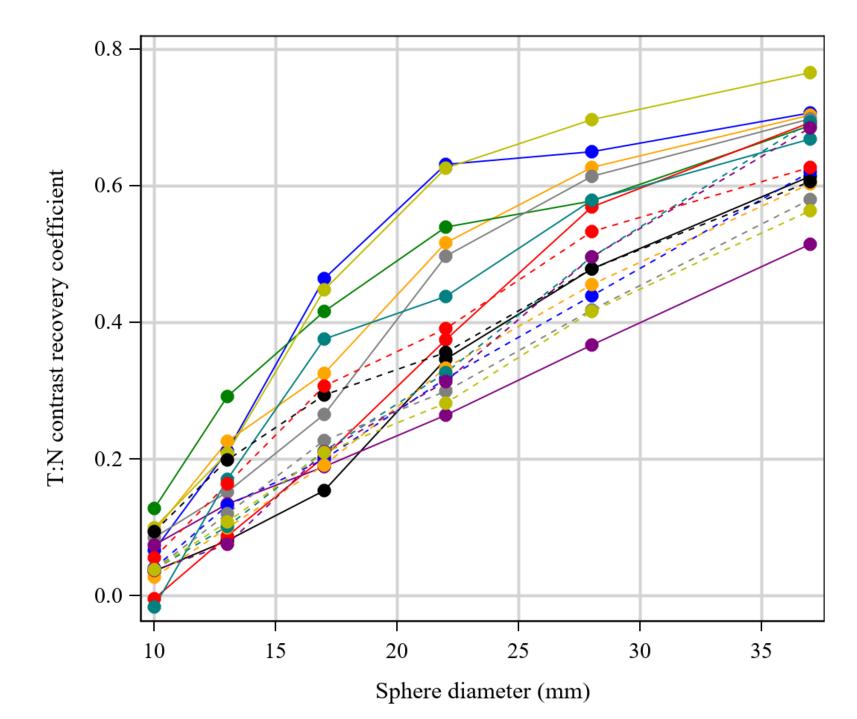
Concusion

A unique, large multicenter phantom study was succesfully organised. It was demonstrated that when no protocol is enforced, large spread in tumour dosimetry is to be expected. If AC and SC are imposed spread reduces dramatically. Harmonization was maximised when a post processing filter was utilised. LSF is relatively insensitive for local protocol choices, but SC substantially improves absolute accuracy.

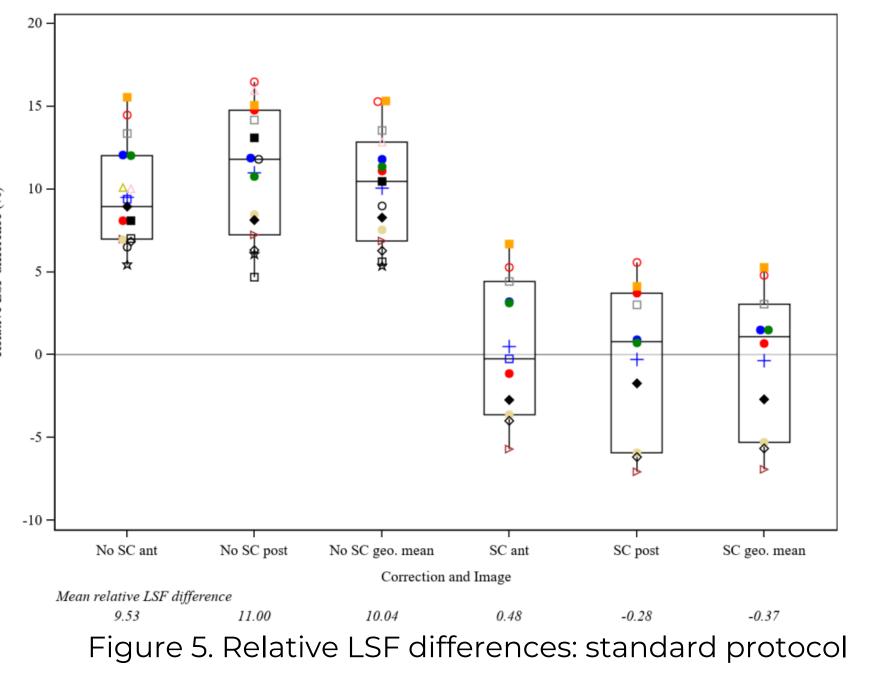
Results







- -Figure 2 shows CRC's by sphere size for site specific protocols, and demonstrates a large range in CRC. This is mainly due to large variance in attenutation correction (AC), scatter correction (SC) and point spread function modelling (PSF) methods.
- CRC for a harmonized protocol ie restricted to sites that have both AC and SC but no PSF modelling, demonstrate much less spread, see figure 3
- Figure 4 demonstrates the effect of applying a site-specific harmonization filter, this acted to reduce variance but at the cost of reducing the average CRC.



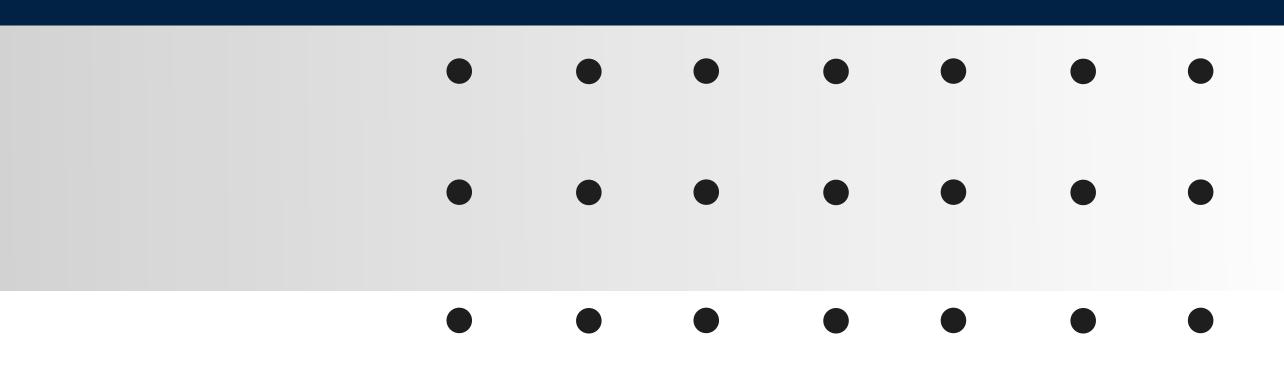


Figure 3. CRCs for site specific protocols with AC and SC

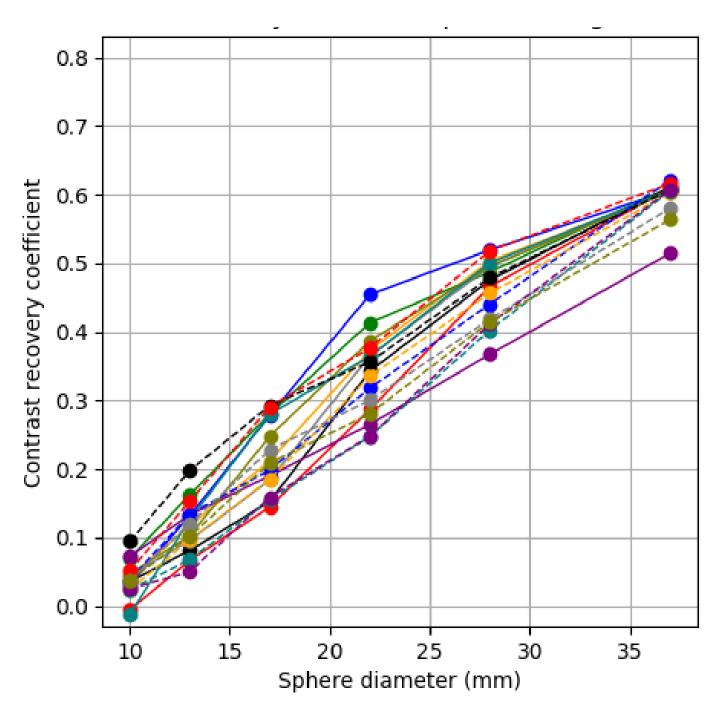


Figure 4. CRCs after post filtering with a camera specific gaussian blur

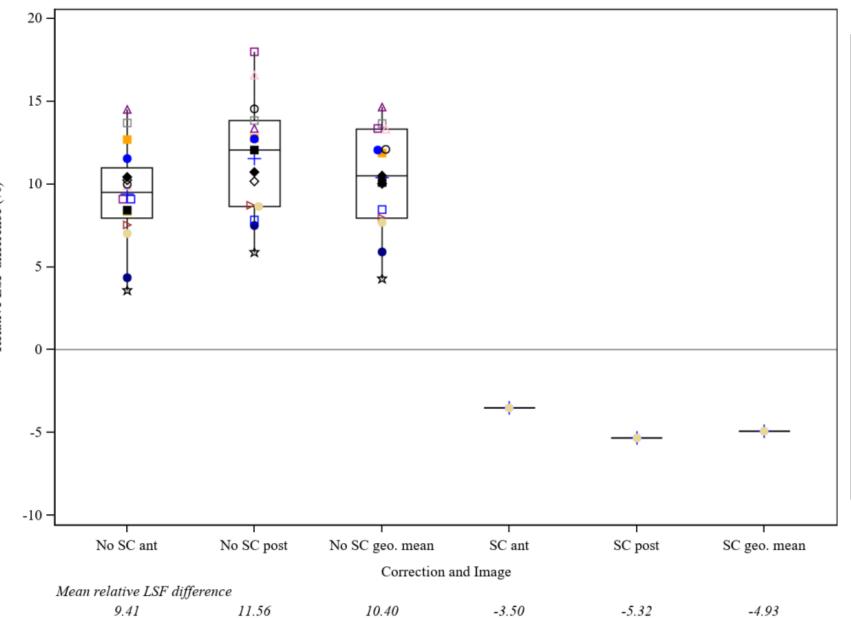


Figure 6. Relative LSF differences: site specific protocols

Figure 5 and Figure 6. show, for standardized and facility acquisition protocols respectively, the relative LSF difference for all centres partitioned by whether or not SC was applied on anterior, posterior and geometric mean images.

NB the limited data for LSF when SC was applied on facility protocols does not allow for any evaluation

